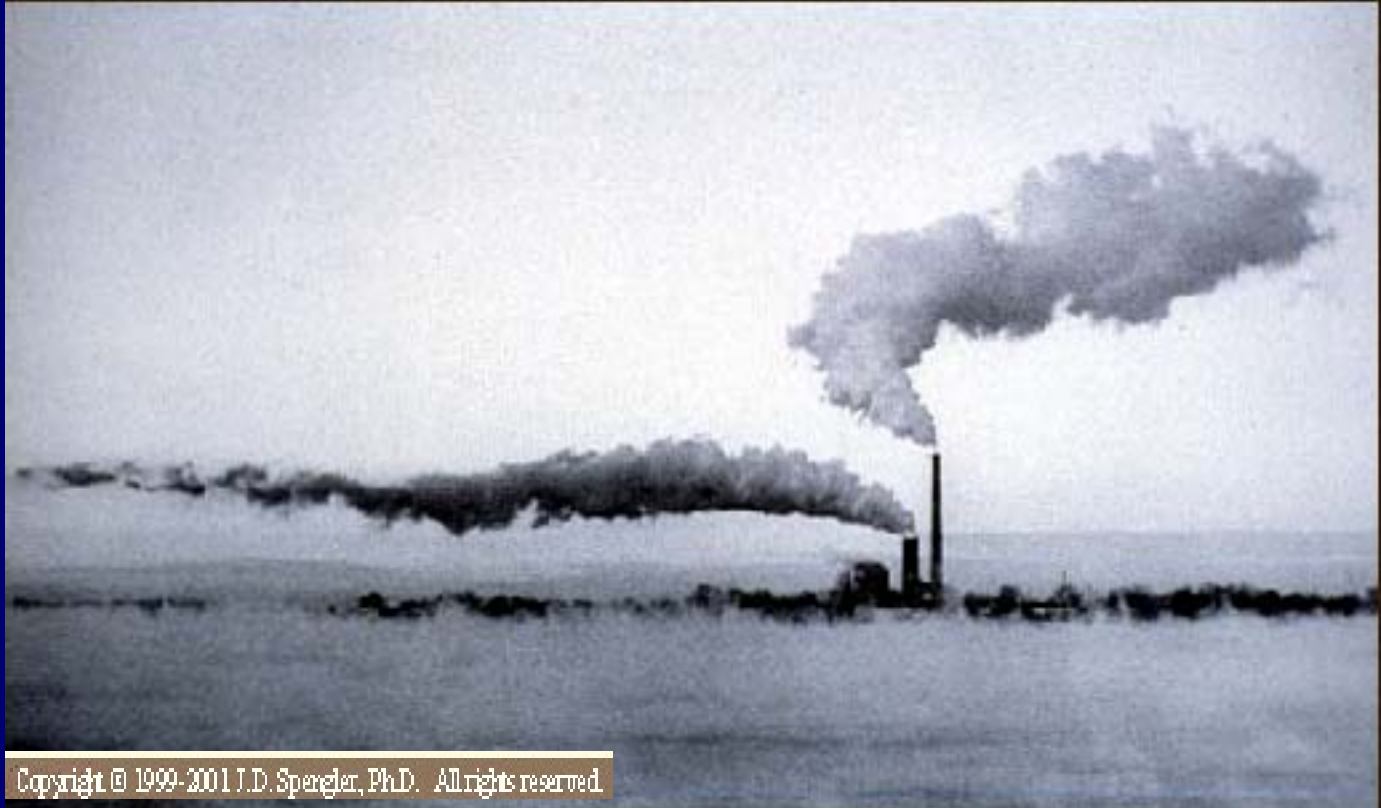


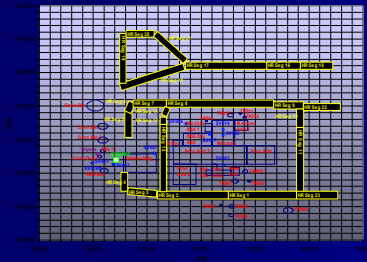
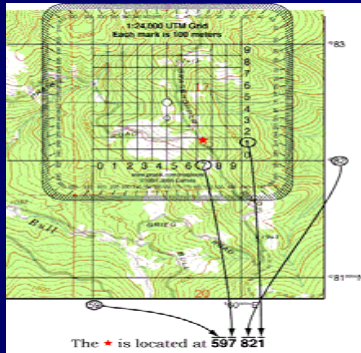
# **Air Pollution Control Program**

## **Ambient Air Quality Impact Analyses**



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# What is an Ambient Air Quality Impact Analysis?



```
SO SRCPARAM 1 0.08647 3.51 5.67 3.26
SO SRCPARAM 2 0.00994 2.5 1.1628 2.3256
SO SRCPARAM 3 1.30817 21.336 505.37 5.73 1.42
SO SRCPARAM 4 0.0006 3.51 1.314 3.26
SO SRCPARAM 5 3.4594E-06 0 16.84 6.7 0 1.3953
SO SRCPARAM 6 3.4594E-06 0 62.57 6.7 0 1.3953
```



An air quality impact analysis serves as a tool for assessing the amount of pollution within the boundary layer (the lowest layer of the atmosphere). It is an attempt to reproduce what is occurring in the real world in an effort to assess pollutant impacts at specific locations using a computer based air quality model. In order to do this, the user needs to know the characteristics of the source(s) and its surroundings.

# Types of Ambient Air Quality Impact Analyses

- Compliance Determinations
- Environmental Impact Assessments
- Permit Applications
- Development of Control Strategies
- Attainment Demonstrations
  - Assesses Responsible Party in Instances Where Existing Air Pollution Levels Exceed the National Ambient Air Quality Standards
  - Determines If Proposed Emission Control Techniques and Strategies Will Be Effective
  - Can Aid in the Selection of Appropriate Ambient Air Monitor Sites
  - Determines the Maximum Allowable Emission Rate that Meets National Ambient Air Quality Standards
  - Determines If Proposed Emission Control Techniques and Strategies Will Be Effective



PM2.5 Monitor @ Belle, Mo



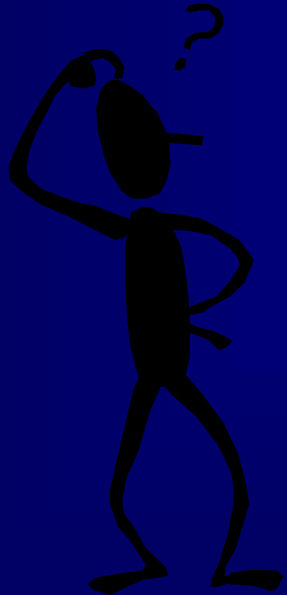
Dust Collection System  
Photo Obtained from: [www.joehillco.com](http://www.joehillco.com)

# National Ambient Air Quality and Increment Standards

<u>Pollutant</u>	<u>Standard</u>	<u>Averaging Time</u>	<u>Concentration</u>
Carbon Monoxide (CO)	NAAQS	8-Hour	10,000 µg/m <sup>3</sup>
		1-Hour	40,000 µg/m <sup>3</sup>
Nitrogen Dioxide (NO <sub>2</sub> )	NAAQS	Annual	100 µg/m <sup>3</sup>
	Increment	Annual	25 µg/m <sup>3</sup>
Ozone (O <sub>3</sub> )	NAAQS	1-Hour	0.12 ppm
		8-Hour	0.08 ppm
Lead (Pb)	NAAQS	Quarterly	1.5 µg/m <sup>3</sup>
Particulate (PM <sub>10</sub> )	NAAQS	24-Hour	150 µg/m <sup>3</sup>
		Annual	50 µg/m <sup>3</sup>
	Increment	24-Hour	30 µg/m <sup>3</sup>
		Annual	17 µg/m <sup>3</sup>
Particulate (PM <sub>2.5</sub> )	NAAQS	24-Hour	65 µg/m <sup>3</sup>
		Annual	15 µg/m <sup>3</sup>
Sulfur Dioxide (SO <sub>2</sub> )	NAAQS	3-Hour	1300 µg/m <sup>3</sup>
		24-Hour	365 µg/m <sup>3</sup>
		Annual	80 µg/m <sup>3</sup>
	Increment	3-Hour	512 µg/m <sup>3</sup>
		24-Hour	91 µg/m <sup>3</sup>
		Annual	20 µg/m <sup>3</sup>

# Does One Model Handle All Pollutants?

No, the Environmental Protection Agency has established a database describing several types of models that have been approved for different modeling activities. Each model varies in complexity from simple screening tools to more refined approaches that actually reproduce air pollution episodes. As the models become more sophisticated, more time and resources are necessary for their execution.



When determining what air quality model is appropriate the user must decide what type of pollutant is being modeled.

# Industrial Source Complex Dispersion Model

The Industrial Source Complex Dispersion Model is a Gaussian model and is the EPA's "Guideline" model for determining compliance with the National Ambient Air Quality and Increment Standards for directly emitted pollutants within Class II areas (CALPUFF must be used to evaluate impacts on Class I areas such as Mingo Wildlife Refuge and will be discussed later).

The Department's Air Pollution Control Program routinely uses this model for New Source Review and Prevention of Significant Deterioration ambient air quality impact analyses in the following instances:

- Screening Results Raise Concerns

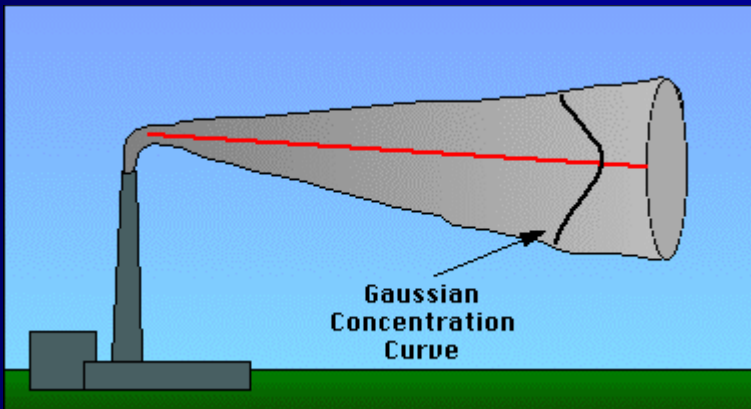
- Complicated Facility Configuration Impossible to Screen

- Prevention of Significant Deterioration Review

*Important! The ISC Model is Limited to Nonreactive Evaluations. It does not have a chemistry module that allows it to predict the conversion of primary pollutants to secondary pollutants.*

# What's A Gaussian Plume Model?

Basically, a Gaussian plume model simulates the dispersion of gases and particles from facilities. Based upon stability, release parameters, and wind profiles, the Gaussian models predict pollutant concentrations downwind of the source. The model assumes that the pollutant concentration is dispersed in the vertical and horizontal in a bell-shaped manner, with the highest concentrations in the center of the plume.



The Highest Concentration Occurs At the Center of the Plume. Wind Speed, Stability, and Exit Parameters Determine the Size and Shape of the Plume.



# Minimum Model Input Requirements

Prior to Executing an Air Dispersion Model, the User Must Determine/Develop:

- Pollutant Being Modeled
- Pollutant Averaging Time(s)
- Emission Rate for Each Emission Release
- Location for Each Emission Release
- Characterization of the Emission Release
- Receptor Locations
- Terrain Heights for Each Emission Release and Receptor Location
- Meteorological Data
- Building Downwash Information
- “Interactive” Source Inventories for NAAQS and Increment Compliance Determinations



# Development of NAAQS and Increment Inventories for Inclusion into Air Quality Analyses

## NAAQS Inventories

### PSD Permits

Includes All Sources w/50 Kilometers of the Furthest Extent of the Significant Impact Area

### Minor Permits

Extent of the Significant Impact Area and the Pollutant Type Being Modeled Determines Which “Nearby” Sources are Included

## Increment Inventories

### PSD Permits

Includes All Sources w/50 Kilometers of Furthest Extent of the Significant Impact Area Who Received a Permit After the Establishment of Baseline Date That Has Impact w/New Area Significant

### Minor Permits

Same as PSD Requirement if the Source is Located w/50 km of an Established Baseline Area

# Model Input Data for NAAQS Compliance Determinations

- Proposed New or Modified Source
  - Emission Estimates Are Based Upon Continuous Operation at the Maximum Allowable Emission Limit or Federally Enforceable Permit Limit
- Nearby Background Sources
  - Emission Estimates Are Based Upon Continuous Operation at the Maximum Allowable Emission Limit or Federally Enforceable Permit Limit

# NAAQS Inventory Development

- Determine Which Pollutants Are of Concern
- Determine Which Sources Are w/50 Km of the Largest Extent of the Significant Impact Area from the New or Modified Source
- Request Emission Inventory Information on a Point by Point Basis from the Emission Inventory Unit
  - Form 1.0 Geophysical Data (UTM Coordinates)
  - Form 2.0 Stack Information, Control Efficiencies, Maximum Design Rates, Emission Factors
  - Form 2.7 Haul Road Fugitive Emissions Worksheet
  - Form 2.8 Storage Pile Worksheet
- Calculate Potential Emissions on a Point by Point Basis
- Develop Release Characteristics for Non-Point Source Releases
- Format Data for Input into the Appropriate Air Quality Model

# Example Emission Release Types

Area Sources (Haul Roads  
Storage Piles)



Volume Sources-  
Conveyors, Screens,  
Crushers



Point Sources-Stack Releases



Form 2.0 Used to Determine Point Source Release Parameters

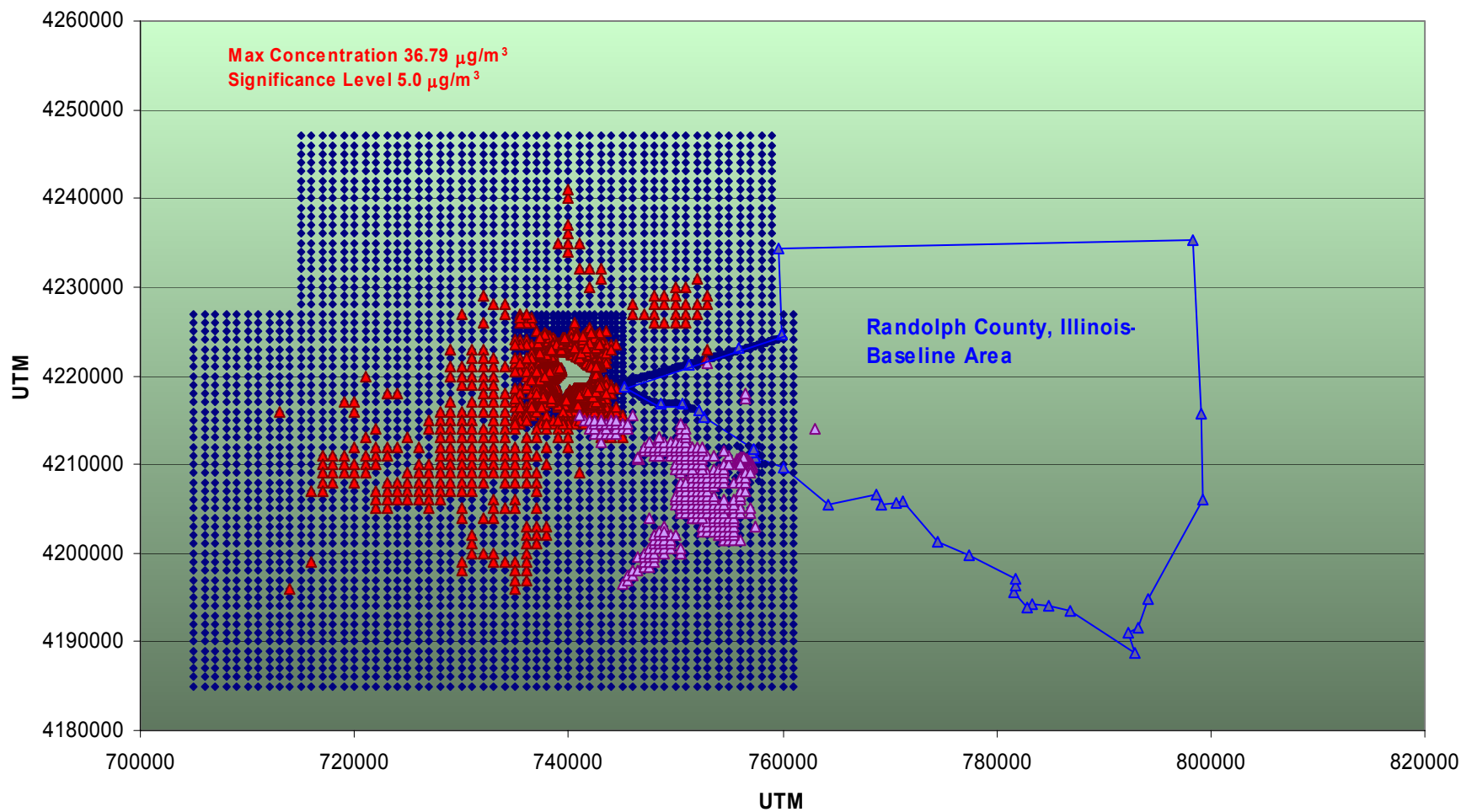
Form 2.7 and Form 2.8 Are Used to Determine Area Source Release Parameters

Volume Source Release Parameters Are Based Upon Industry Averages

# **Model Input Data for Prevention of Significant Deterioration Increment Compliance Determinations**

- **Proposed New or Modified Source (PSD)**
  - Emission Estimates Are Based Upon Continuous Operation at the Maximum Allowable Emission Limit or Federally Enforceable Permit Limit
- **Nearby Background Sources (Major and Minor Sources)**
  - Emission Estimates Are Based Upon the Most Recent 2-year Average Actual Emission Estimates for Any Piece of Equipment, Emission Increase or Other Modification that Was Permitted After the Establishment of the Minor Source Baseline Date
  - If the 2-year Average Actual Emissions Are Not Available or Are “Unidentifiable”, Potential Emission Estimates from the Permit Application Are Obtained

# Baseline Areas 24-Hour Averaging Period-SO<sub>2</sub>



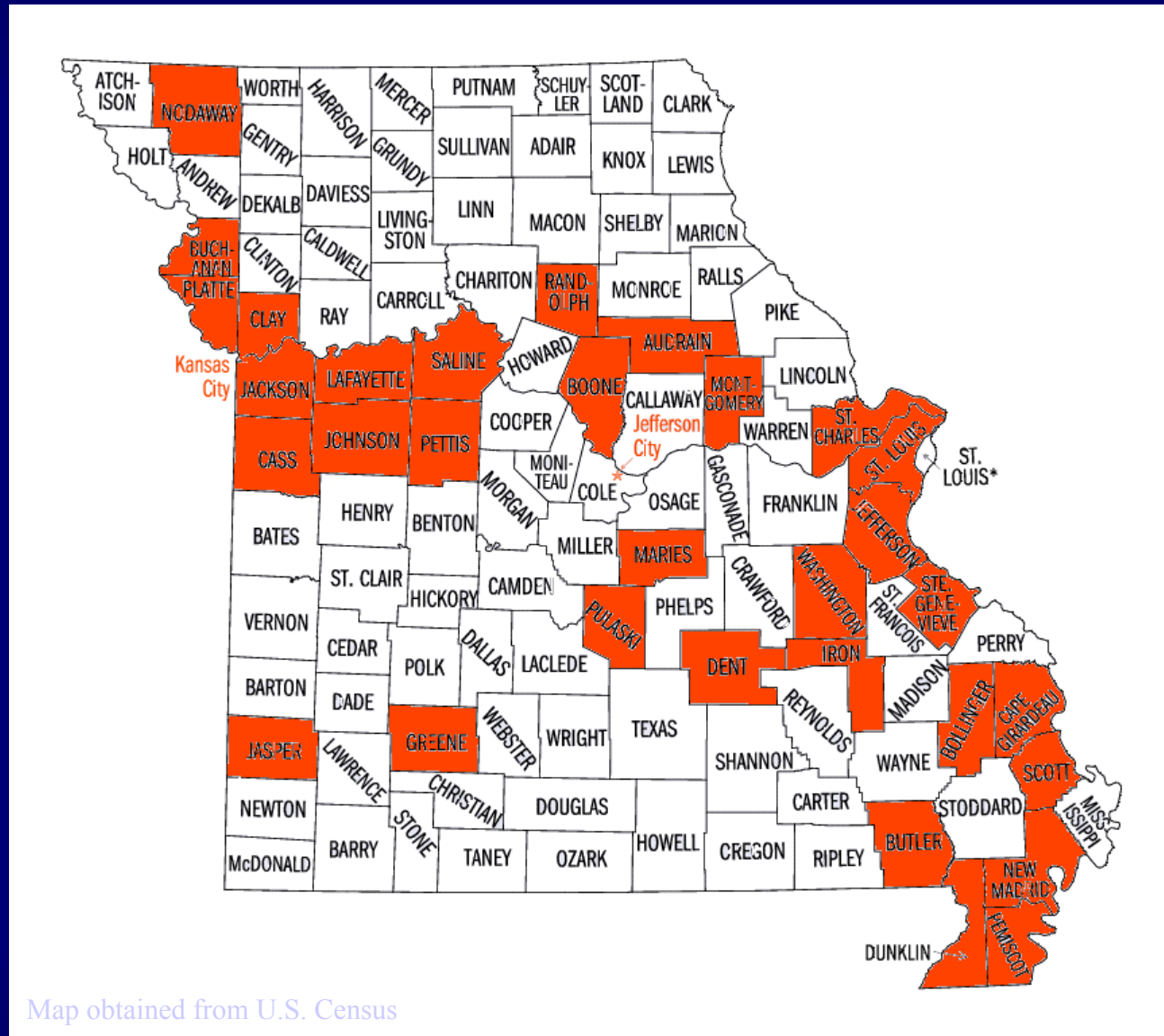
◆ Receptor Grid    ▲ X >= 5.0    —▲ Randolph County Baseline Area    ▲ Chemical Lime Baseline Receptors

# Increment Inventory Development

- Determine Which Pollutants Are of Concern
- Determine If a Baseline Area Has Been Established
- Determine Who Has Received A Permit Since the Establishment of the Baseline Date That Could Contribute to Increment Expansion or Consumption
- Review Each Permit That Has Been Issued to Determine Which Emission Points Must Be Included in the Emission Inventory
- Request Emission Inventory Information on a Point by Point Basis from the Emission Inventory Unit for the Previous 2-Year Period
  - Form 1.0 Geophysical Data (UTM Coordinates)
  - Form 2.0 Stack Information, Control Efficiencies, Maximum Design Rates, Emission Factors
  - Form 2.7 Haul Road Fugitive Emissions Worksheet
  - Form 2.8 Storage Pile Worksheet
- Locate Each Emission Point on the EIQ That Was Identified During the Permit Review and Calculate the 2-Year Average Actual Emissions the Calculate Potential Emissions on a Point by Point Basis
- Develop Release Characteristics for Non-Point Source Releases
- Format Data for Input into the Appropriate Air Quality Model



## Counties Where Prevention of Significant Deterioration Sources Have Been Permitted



It is important to note that this map does not depict the extent of the significant impact area of each source permitted. As such surrounding counties may have triggered the minor source baseline date.



## **Garbage In, Garbage Out**

### **Models Are Limited by the Amount and Accuracy of Data Input**

If Accurate Data is Unavailable w/EIQ:

- Use Permitted Limits for Both the NAAQS and Increment Inventories
- Contact Individual Facilities for Additional Information

Implications:

- Increment Consumption May Be Overestimated
- Inventory Development Delays May Lead to Permit Issuance Delays
- NAAQS or Increment Violations Would Need to Be Resolved Prior to Permit Issuance